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BOOK OF PROBLEMS

IN ARITHMETIC

BY

GEO. A. WALTON AND FRANCIS COGSWELL



BOSTON
BREWER & TILESTON
1873

Edw T 118.73.880

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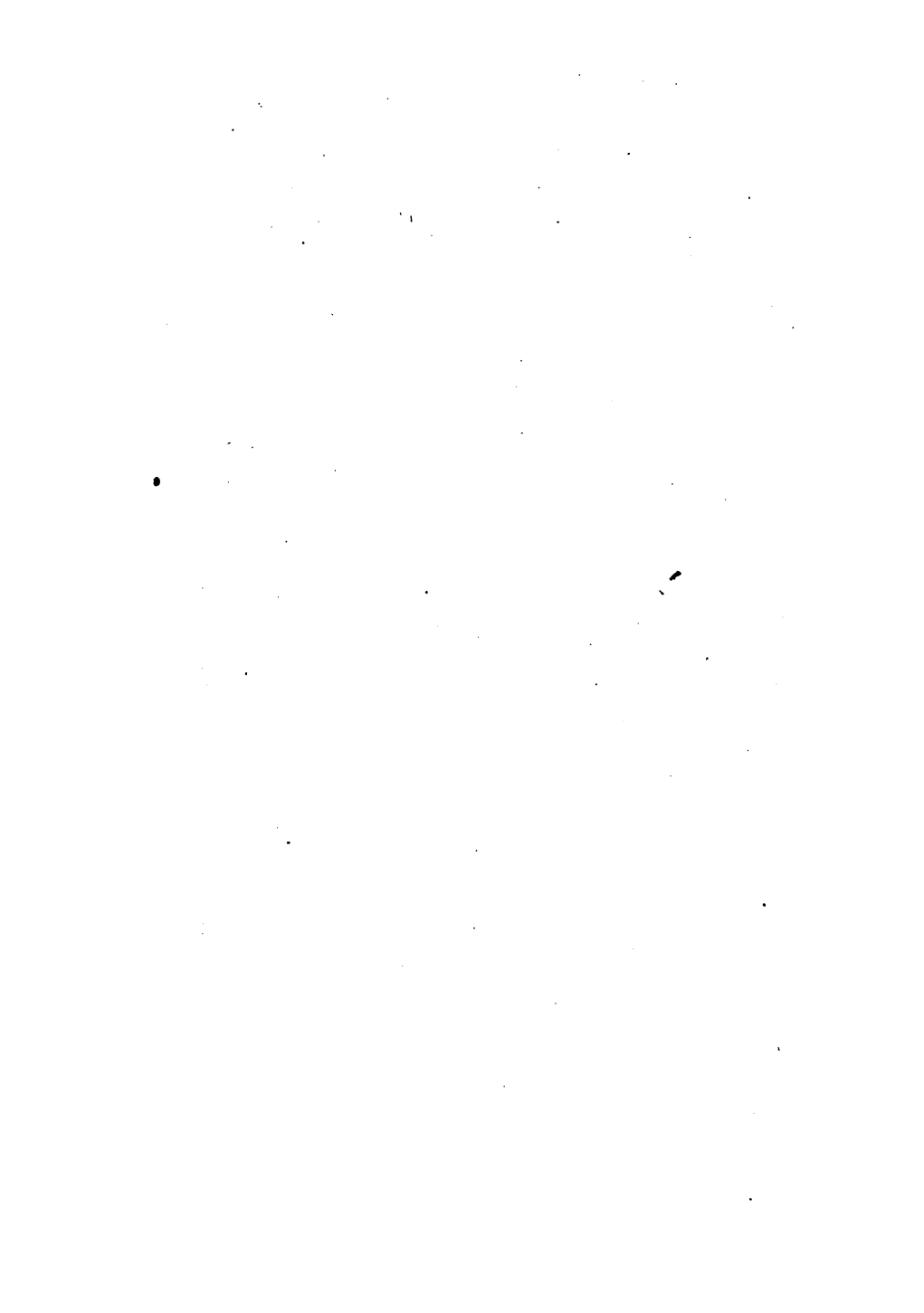


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PREFACE.

THE BOOK OF PROBLEMS contains more than *twelve thousand* examples for practice, embracing all the applications of arithmetic usually presented in text-books. The work is designed especially for class drill. It may, however, be used as an ordinary text-book in arithmetic.

The exercises are arranged in series, so that a *different* example can be assigned to each individual with as much ease as the *same* example is ordinarily assigned to a whole class.

The Book of Problems and the Key to the same are complements of each other, and together constitute a system of Dictation Exercises entirely original in method and aim. The former is designed for the pupil and the latter for the teacher.

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EXPLANATION OF THE USE OF THE ARITHMETICAL TABLE.

(See pages 4 and 6.)

ADDITION. - When the direction is given to add one column,* as in Exercises 1, 2, etc., page 5, the numbers expressed in each single column between the given lines, "C to A," "E to A," etc., constitute one example; thus, under each of the directions, from 1 to 6, inclusive, on page 5, 21 examples are to be performed.

When the direction is given to add two columns, as in Exercises 7, 8, etc., the numbers expressed in each *two* columns between the given lines, "C to A," "D to A," etc., constitute one example, the right hand column of the two expressing *units*, the left expressing *tens*; thus, under each of the directions from 7 to 12, inclusive, on page 5, 20 examples are to be performed.

When the direction is given to add three columns, as in Exercises 13, 14, etc., the numbers expressed in each *three* columns between the given lines, "D to A," "E to A," etc., constitute one example, the right hand column of the three expressing *units*, the middle *tens*, the left *hundreds*, etc., etc.

SUBTRACTION. - When, as in Exercise 33, it is required to take 234 out of 1 to 4 in each line,* each line of four figures at the *right* of the Table expresses a minuend out of which 234 is to be taken; thus, under each direction, 25 examples are to be performed.

MULTIPLICATION. - When, as in Exercise 48, page 7, it is required to multiply the number expressed in 19 to 21, each line of three figures at the left of the Table expresses a multiplicand which is to be multiplied by 2; thus, under each direction, 25 examples are to be performed.

DIVISION. - The explanation above for Multiplication, renders any explanation for Division unnecessary.

 Pupils should be required occasionally to write out in full the examples assigned, thus: -

Exercise 13, Example 1. Add 476, 692, 337, and 184.

Exercise 13, Example 2. Add 747, 269, 533, and 718.

Exercise 48, Example 1 (A). Multiply 987 by 2.

* A single vertical row of figures on the Table is a *column*, a single horizontal row is a *line*.

ARITHMETICAL TABLE.

Explanation of Table on previous page.

	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	*
A	-9	8	7	4	4	9	0	2	5	9	8	7	9	1	5	3	1	7	1	8	4	- A
B	-9	0	5	7	8	8	8	8	4	4	2	5	8	7	5	9	9	5	3	3	7	- B
C	-6	7	9	4	3	5	5	6	8	6	7	2	6	1	7	8	7	2	6	9	2	- C
D	-3	6	9	6	6	3	5	3	6	3	0	7	8	6	8	3	2	7	4	7	6	- D
E	-1	5	3	9	6	7	8	5	6	2	1	6	5	7	5	4	3	6	2	0	8	- E
F	-8	8	8	4	5	5	5	5	0	3	2	1	3	8	7	2	1	6	3	5	6	- F
G	-8	0	6	3	9	9	5	1	6	1	1	1	6	9	4	5	0	3	5	7	5	- G
H	-9	1	7	5	1	7	2	4	4	8	7	2	9	4	6	8	4	2	9	9	3	- H
I	-9	2	7	9	3	1	3	3	0	5	6	4	6	4	9	4	7	1	8	8	8	- I
J	-9	5	3	2	0	5	6	4	9	8	7	6	8	0	7	1	7	4	4	4	7	- J
K	-6	6	7	8	7	1	6	6	8	3	1	8	2	0	6	8	6	2	2	0	6	- K
L	-7	2	8	4	3	1	6	6	9	4	1	9	5	2	6	3	5	4	4	1	7	- L
M	-8	4	5	2	1	9	2	4	8	1	8	7	8	4	9	5	3	4	6	2	1	- M
N	-1	4	4	8	6	8	1	5	2	1	6	0	2	1	6	1	1	1	5	8	4	- N
O	-2	2	5	1	8	9	3	9	3	8	7	5	4	5	4	1	9	7	2	9	0	- O
P	-1	9	9	5	9	8	9	8	2	2	8	4	5	7	5	4	9	0	9	4	0	- P
Q	-9	4	1	5	2	9	5	5	5	2	9	4	1	8	0	8	7	6	7	0	0	- Q
R	-7	9	5	7	2	1	8	2	3	8	9	6	5	9	4	9	0	2	2	9	8	- R
S	-7	3	4	2	5	6	3	2	1	5	1	7	8	0	6	3	9	6	4	7	5	- S
T	-3	2	3	5	8	3	5	3	0	8	9	4	5	1	6	4	8	4	6	2	7	- T
U	-8	2	4	1	7	4	7	7	4	2	8	7	4	9	9	2	3	5	5	8	6	- U
V	-7	6	9	4	1	6	2	6	8	4	0	6	3	6	4	3	8	7	2	1	9	- V
W	-1	0	8	8	2	4	8	2	4	7	1	6	7	6	2	8	9	7	9	8	4	- W
X	-8	7	2	8	9	2	9	8	2	8	7	2	8	9	8	6	2	4	7	6	8	- X
Y	-4	4	4	7	6	4	4	2	5	5	7	4	4	5	7	4	7	6	5	1	1	- Y

* A single vertical row of figures in the Table is a column; a single horizontal row is a line; 1, 2, 3, etc., denote columns; A, B, C, etc., denote lines. The letters *v*, *w*, *x*, etc., denote the single lines of figures above the braces.

EXERCISES ON THE TABLE.

For explanation see page 3.

ADDITION.

Add 1 Column.

1. From C to A.*
2. From E to A.
3. From G to A.
4. From I to A.
5. From L to A.
6. From Y to A.

Add 2 Columns.

7. From C to A.
8. From D to A.
9. From F to A.
10. From H to A.
11. From K to A.
12. From Y to A.

Add 3 Columns.

13. From D to A.
14. From E to A.
15. From G to A.
16. From K to A.
17. From Q to A.
18. From T to A.
19. From Y to A.

Add 4 Columns.

20. From C to A.
21. From F to A.
22. From I to A.
23. From O to A.
24. From W to A.

Add 6 Columns.

25. From Y to T.
26. From Y to R.
27. From R to A.
28. From Y to A.

$$29. v + w + x = ?†$$

$$30. w + x + y + z = ?$$

$$31. v + w + x + y + z = ?$$

$$32. v + w + x + y + z + x + y = ?$$

SUBTRACTION.

Out of the number expressed in 1 to 4,* in each line —

	<i>Take</i>		<i>Take</i>
33.	234.	36.	567.
34.	345.	37.	678.
35.	456.	38.	789.

39. Out of the number expressed in 1 to 4 of each line take the number expressed in 1 to 3 of the next below.

40. Out of 4 to 9 of each line take 4 to 8 of the next below.

41. Out of 7 to 12 of each line take 7 to 11 of the next below.

42. Out of 13 to 19 of each line take 13 to 18 of the next below.

43. Out of 1,001,001 take 16 to 21.

Out of 987,654,321 —

<i>Take</i>	<i>Take</i>
44. 1 to 9.	46. 10 to 18.
45. 7 to 15.	47. 13 to 21.

* Inclusive. The lines and columns named should always be included in the exercises.

† The letters *v, w, x, y,* and *z* stand for each number expressed in the Table above the brace over the respective letters *v, w, x, y,* and *z.*

NOTATION AND NUMERATION.

A

1. Nine hundred fourteen thousand, forty-one.
2. One million, forty thousand, fourteen.
3. Nine hundred seventy-six thousand, sixty-seven.
4. Sixteen hundred seventy-eight.
5. Sixty-three million, three hundred six thousand.
6. Nineteen million, nine hundred thousand, 19.
7. One hundred seventy million, seven.
8. Ten million, one thousand, one hundred one.
9. Three hundred five million, fifty thousand.
10. Twelve million, two hundred thousand, two.
11. One million, eighteen thousand, eight.
12. One billion, six hundred thousand, six.
13. Nine hundred four million, ninety-four.
14. Three billion, thirty million, three hundred three.
15. Two billion, four hundred twelve thousand, 14.
16. One hundred one million, one thousand, one.
17. Six billion, sixty thousand, six hundred.
18. Four hundred three billion, thirty.
19. One trillion, seventeen million.
20. 506 billion, sixty-five thousand, five.
21. Four trillion, four billion, four thousand.
22. Six hundred eighty-nine billion, six thousand, 89.
23. Forty-two trillion, forty thousand, two hundred.
24. Eighteen trillion, 108 million, eighteen.
25. Four trillion, forty-seven billion, 4700.

EXERCISES IN SIMPLE NUMBERS.

144. Express A in figures.	Examples.	B $\overbrace{x y z}$	156. What did a railroad ticket cost me which I sold for B* cents, and by so doing lost \$1.62?
145.	1.	4 4 9	157. What did a valise cost me which I sold for B cents, and by so doing gained \$0.87?
Add, in A, from 1 to 6; 2 to 7; etc.	2.	7 8 8	158. How many sheep at \$12 each can be bought for B dollars, and how many dollars will remain?
146.	3.	4 3 5	159. How much can a person earn in B days, working $x\frac{1}{2}$ hours a day, at 45 cents per hour?
Add, in A, the 1st and 2d; 2d and 3d; etc.	4.	6 6 3	160. What will be gained by buying B acres of land at \$295 per acre, and selling it at \$583 per acre?
147.	5.	9 6 7	161. How many bottles, each containing x ounces, can be filled from B pounds of oil, there being 16 ounces in 1 pound?
Find, in A, the difference — 1st and 2d; 2d and 3d; etc.	6.	4 5 5	162. A boy saved x cents on Monday, y cents on Tuesday, z cents on Wednesday, and twice as much in the remainder of the week; in how many weeks would he save B cents?
148.	7.	3 9 9	163. If x acres of land sell for \$8,190.00 what will B acres sell for?
A $\times$ 6.	8.	5 1 7	164. Two men start at different places, distant B miles, and travel towards each other, one at the rate of x miles, the other at the rate of z miles per hour; in how many hours will they meet?
149.	9.	9 3 1	165. What number multiplied by x will produce B?
A $\times$ 7.	10.	2 0 5	166. What number divided by $x + y$ will give B for a quotient?
150.	11.	8 7 1	* B stands for each number expressed under the brace in the column of figures; hence, under each of the Exercises there are 25 examples; thus, under Exercise 156 the examples are as follows:—
A $\times$ 8.	12.	4 3 1	
151.	13.	2 1 9	1. What did a railroad ticket cost me which I sold for 449 cents, etc.
A $\times$ 9.	14.	8 6 8	2. What did a railroad ticket cost me which I sold for 788 cents, etc.
152.	15.	1 8 9	† The letters x, y, z , stand for each number expressed below the respective letters x, y , and z , in the column of figures.
A + 6.	16.	5 9 8	
153.	17.	5 2 9	
A + 7.	18.	7 2 1	
154.	19.	2 5 6	
A + 8.	20.	5 8 3	
155.	21.	1 7 4	
A + 9.	22.	4 1 6	
	23.	8 2 4	
	24.	8 9 2	
	25.	7 6 4	
		$x y z$	

FRACTIONS.

	A	B	C	D	E	F	G	H
1.	$\frac{8}{8}$	$\frac{1}{2}$	$\frac{8}{8}$	$\frac{188}{8}$	$7\frac{1}{2}$	9	$12\frac{3}{4}$	72
2.	$\frac{9}{10}$	$\frac{5}{21}$	$\frac{7}{7}$	$\frac{324}{7}$	$8\frac{2}{5}$	15	$24\frac{1}{2}$	27
3.	$\frac{15}{18}$	$\frac{6}{11}$	$\frac{15}{22}$	$\frac{390}{5148}$	$4\frac{2}{3}$	6	$18\frac{1}{3}$	64
4.	$\frac{8}{15}$	$\frac{2}{10}$	$\frac{8}{8}$	$\frac{881}{881}$	$9\frac{1}{2}$	12	$28\frac{1}{3}$	76
5.	$\frac{6}{7}$	$\frac{9}{12}$	$\frac{14}{15}$	$\frac{972}{1080}$	$6\frac{2}{5}$	14	$42\frac{1}{2}$	84
6.	$\frac{17}{17}$	$\frac{15}{15}$	$\frac{10}{10}$	$\frac{602}{1280}$	$5\frac{1}{4}$	8	$32\frac{1}{2}$	96
7.	$\frac{8}{12}$	$\frac{9}{14}$	$\frac{14}{18}$	$\frac{368}{328}$	$4\frac{1}{3}$	10	$15\frac{2}{3}$	80
8.	$\frac{7}{16}$	$\frac{2}{21}$	$\frac{8}{8}$	$\frac{425}{495}$	$1\frac{1}{3}$	7	$21\frac{1}{2}$	63
9.	$\frac{8}{8}$	$\frac{2}{8}$	$\frac{12}{12}$	$\frac{122}{122}$	$2\frac{1}{3}$	23	$54\frac{1}{2}$	75
10.	$\frac{12}{12}$	$\frac{7}{7}$	$\frac{20}{20}$	$\frac{728}{728}$	$5\frac{3}{8}$	20	$48\frac{3}{4}$	56
11.	$\frac{4}{4}$	$\frac{17}{21}$	$\frac{7}{7}$	$\frac{1232}{1232}$	$9\frac{1}{2}$	21	$35\frac{3}{8}$	91
12.	$\frac{11}{12}$	$\frac{3}{22}$	$\frac{9}{33}$	$\frac{769}{1538}$	$3\frac{1}{2}$	24	$36\frac{1}{2}$	60
13.	$\frac{8}{8}$	$\frac{18}{18}$	$\frac{22}{22}$	$\frac{298}{298}$	$2\frac{1}{8}$	5	$45\frac{1}{8}$	57
14.	$\frac{7}{7}$	$\frac{6}{14}$	$\frac{8}{15}$	$\frac{2841}{4735}$	$6\frac{1}{3}$	16	$56\frac{1}{2}$	88
15.	$\frac{7}{12}$	$\frac{1}{4}$	$\frac{16}{16}$	$\frac{316}{316}$	$5\frac{1}{3}$	18	$54\frac{2}{3}$	90
16.	$\frac{3}{3}$	$\frac{2}{10}$	$\frac{12}{15}$	$\frac{647}{647}$	$2\frac{1}{5}$	22	$55\frac{1}{2}$	77
17.	$\frac{7}{7}$	$\frac{4}{4}$	$\frac{8}{8}$	$\frac{368}{368}$	$3\frac{2}{3}$	17	$51\frac{1}{3}$	85
18.	$\frac{7}{10}$	$\frac{2}{7}$	$\frac{13}{13}$	$\frac{148}{548}$	$7\frac{1}{3}$	13	$40\frac{1}{4}$	61
19.	$\frac{5}{5}$	$\frac{1}{6}$	$\frac{11}{11}$	$\frac{483}{483}$	$8\frac{1}{3}$	19	$38\frac{1}{3}$	95
20.	$\frac{9}{14}$	$\frac{1}{3}$	$\frac{4}{4}$	$\frac{222}{322}$	$4\frac{1}{2}$	11	$44\frac{1}{2}$	66
21.	$\frac{10}{11}$	$\frac{3}{10}$	$\frac{7}{12}$	$\frac{445}{534}$	$9\frac{1}{6}$	24	$36\frac{2}{3}$	78
22.	$\frac{10}{10}$	$\frac{3}{15}$	$\frac{8}{8}$	$\frac{473}{473}$	$3\frac{1}{2}$	12	$18\frac{2}{5}$	57
23.	$\frac{11}{11}$	$\frac{2}{13}$	$\frac{8}{11}$	$\frac{804}{2680}$	$8\frac{2}{5}$	28	$63\frac{1}{4}$	84
24.	$\frac{13}{13}$	$\frac{1}{12}$	$\frac{10}{10}$	$\frac{620}{1116}$	$6\frac{1}{3}$	15	$33\frac{1}{3}$	93
25.	$\frac{16}{21}$	$\frac{2}{11}$	$\frac{5}{14}$	$\frac{824}{1442}$	$7\frac{1}{9}$	26	$39\frac{2}{3}$	65

EXERCISES.

167. Find* the prime factors of the numerators in D.
 168. Find the prime factors of the denominators in D.
 169. Find the prime factors of F and G,* taken as one number.
 170. Find the prime factors of G* and H taken as one number.
 171. Find the G. C. D. of the numbers in D.
 172. Find the G. C. D. of F, G,* and H.
 173. Find the L. C. M. of F, G,* and H.
 174. Find the L. C. M. of E,* F, G,* and H.
 175. Reduce to lowest terms the fractions in D.
 176. Reduce to lowest terms G* for numerators; H for denominators.
 177. Reduce to improper fractions the mixed numbers in G.
 178. Reduce to improper fractions H and D as a mixed number.
 179. Reduce to mixed numbers G* and H for numerators, F for denominators.
 180. Reduce to mixed numbers F and G* for numerators, H for denominators.
 181. Find the G. C. D. of A, C, and E.
 182. Find the L.C.M. of B,C,E.
 183. Simplify A of B of C.
 184. Simplify A of B of C of D.
 185. Simplify A of B of C of E.
 186. Simplify A of B of C of D of E of F.
 187. Find the amount of A and C.
 188. Find the amount of B and the fractions in E.
 189. $A + B + C$.
 190. $B + C + D$.
 191. $C + D + E$.
 192. $D + E + F$.
 193. $A + B + C + D$.
 194. $B + C + D + E$.
 195. A of B + C + D.
 196. $E + F + G + H$.
 197. $A - B$.
 198. $C - B$.
 199. $H - G$.
 200. $G - E$.
 201. $(H + A) - G$.
 202. $A - B$ of C.
 203. C of E - A of B.
 204. Difference C and D.
 205. $A \times B$.
 206. $B \times C$.
 207. $C \times E$.
 208. $C \times F$.
 209. $H \times A$.
 210. $G \times F$.
 211. $H \times G$.
 212. $G \times E$.
 213. $A \div B$.
 214. $B \div C$.
 215. $C \div E$.
 216. $C \div F$.
 217. $H \div A$.
 218. $E \div F$.
 219. $H \div G$.
 220. $G \div E$.
 221. A of F + E.
 222. A of C + B of E.
 223. $(A+B) \div (B \times C)$.
 224. $(A-B) \div (B \div C)$.
 225. A of B of C + D + E.
 226. A + B of C + D of E.
 227. $(A+C) - B$.
 228. $(E \times F) + G$.
 229. A of E $\times$ $\frac{A-B}{B+C} \div \frac{A-B}{G \div F}$.
 230. $\frac{F-A}{E+B} \div \frac{C \times B}{A+G}$.
 231. E is A of what number?
 232. C of H is B of what number?
 233. If G is B of some number, what is C of the same number?
 234. H is C of how many times E?
 235. C of E is B of how many times A?
 236. Change C to an equivalent fraction having E for a denominator.

* Omit fractions.

FRACTIONS.

	A	B	C	D	E	F	G	H
1.	$\frac{8}{12}$	$\frac{7}{12}$	$\frac{6}{12}$	$\frac{188}{12}$	$\frac{7}{12}$	9	$\frac{123}{12}$	72
2.	$\frac{9}{10}$	$\frac{5}{11}$	$\frac{7}{12}$	$\frac{324}{12}$	$\frac{8}{12}$	15	$\frac{247}{12}$	27
3.	$\frac{11}{18}$	$\frac{6}{11}$	$\frac{13}{12}$	$\frac{5140}{12}$	$\frac{4}{12}$	6	$\frac{184}{12}$	64
4.	$\frac{8}{15}$	$\frac{20}{12}$	$\frac{5}{12}$	$\frac{881}{12}$	$\frac{9}{12}$	12	$\frac{288}{12}$	76
5.	$\frac{6}{12}$	$\frac{8}{12}$	$\frac{11}{12}$	$\frac{10720}{12}$	$\frac{6}{12}$	14	$\frac{427}{12}$	84
6.	$\frac{11}{17}$	$\frac{16}{15}$	$\frac{10}{12}$	$\frac{12920}{12}$	$\frac{5}{12}$	8	$\frac{324}{12}$	96
7.	$\frac{8}{12}$	$\frac{9}{14}$	$\frac{11}{12}$	$\frac{368}{12}$	$\frac{4}{12}$	10	$\frac{153}{12}$	80
8.	$\frac{7}{16}$	$\frac{21}{12}$	$\frac{5}{12}$	$\frac{486}{12}$	$\frac{1}{12}$	7	$\frac{217}{12}$	63
9.	$\frac{6}{12}$	$\frac{8}{12}$	$\frac{12}{12}$	$\frac{127}{12}$	$\frac{2}{12}$	23	$\frac{541}{12}$	75
10.	$\frac{11}{12}$	$\frac{7}{12}$	$\frac{20}{12}$	$\frac{728}{12}$	$\frac{5}{12}$	20	$\frac{487}{12}$	56
11.	$\frac{4}{12}$	$\frac{11}{12}$	$\frac{7}{12}$	$\frac{12320}{12}$	$\frac{9}{12}$	21	$\frac{353}{12}$	91
12.	$\frac{11}{12}$	$\frac{22}{12}$	$\frac{30}{12}$	$\frac{1638}{12}$	$\frac{3}{12}$	24	$\frac{369}{12}$	60
13.	$\frac{8}{12}$	$\frac{11}{12}$	$\frac{22}{12}$	$\frac{2904}{12}$	$\frac{2}{12}$	5	$\frac{453}{12}$	57
14.	$\frac{7}{12}$	$\frac{6}{14}$	$\frac{15}{12}$	$\frac{2841}{12}$	$\frac{6}{12}$	16	$\frac{562}{12}$	88
15.	$\frac{7}{12}$	$\frac{1}{12}$	$\frac{16}{12}$	$\frac{312}{12}$	$\frac{5}{12}$	18	$\frac{542}{12}$	90
16.	$\frac{2}{12}$	$\frac{20}{12}$	$\frac{12}{12}$	$\frac{647}{12}$	$\frac{2}{12}$	22	$\frac{551}{12}$	77
17.	$\frac{7}{12}$	$\frac{4}{12}$	$\frac{8}{12}$	$\frac{138}{12}$	$\frac{3}{12}$	17	$\frac{513}{12}$	85
18.	$\frac{7}{10}$	$\frac{2}{12}$	$\frac{13}{12}$	$\frac{148}{12}$	$\frac{7}{12}$	13	$\frac{401}{12}$	61
19.	$\frac{5}{12}$	$\frac{1}{12}$	$\frac{11}{12}$	$\frac{483}{12}$	$\frac{8}{12}$	19	$\frac{386}{12}$	95
20.	$\frac{8}{14}$	$\frac{1}{12}$	$\frac{4}{12}$	$\frac{324}{12}$	$\frac{4}{12}$	11	$\frac{442}{12}$	65
21.	$\frac{10}{11}$	$\frac{3}{10}$	$\frac{7}{12}$	$\frac{445}{12}$	$\frac{9}{12}$	24	$\frac{367}{12}$	78
22.	$\frac{11}{18}$	$\frac{3}{16}$	$\frac{8}{12}$	$\frac{473}{12}$	$\frac{3}{12}$	12	$\frac{182}{12}$	57
23.	$\frac{11}{14}$	$\frac{2}{13}$	$\frac{11}{12}$	$\frac{804}{12}$	$\frac{8}{12}$	28	$\frac{634}{12}$	84
24.	$\frac{4}{13}$	$\frac{1}{12}$	$\frac{10}{12}$	$\frac{620}{12}$	$\frac{6}{12}$	15	$\frac{331}{12}$	93
25.	$\frac{11}{21}$	$\frac{2}{11}$	$\frac{5}{14}$	$\frac{824}{12}$	$\frac{7}{12}$	26	$\frac{392}{12}$	65

EXERCISES.

237. What number is that from which if you take A, the remainder will be B?
238. What number is that to which if you add C of E, the sum will be G?
239. What number multiplied by F will give G for a product?
240. What number divided by E will give D for a quotient?
241. What divisor will give E for a quotient, H being the dividend?
242. What number is that A of which exceeds B by E?
243. What number is that to which if A of itself be added, the sum will equal H?
244. What number is that from which if B of itself be subtracted, the remainder will be F?
245. The sum of two numbers is H, and the difference is E; what is the smaller number?
246. The sum of two numbers is H, and one of the numbers is E times the other; what is the larger number?
247. Divide H into three such parts that the 2d shall be twice the 1st, and the 3d F more than the 2d. What is the 3d part?
248. At E dollars a yard what will F yards of cloth cost?
249. At E dollars a yard how many yards of cloth can be bought for F dollars?
250. If F yards of cloth cost G dollars, what will C yards cost?
251. If B pounds of tea cost H cents, what will E pounds cost?
252. John can do a piece of work in E days, and James can do the same work in F days; in what time can both together do it?
253. If George and Albert can do a piece of work in E days, and Albert can do it alone in F days, in what time can George do it alone?
254. What would be the cost of fencing a lot of land H rods long and F rods wide, at E cents per foot?
255. How many square yards of carpeting will cover a floor G feet long and F feet wide?
256. How many yards of carpeting A yards wide will cover a floor F feet square?
257. How many square feet of leather will cover a box G inches long, F inches wide, and E inches high?
258. How many cords of wood in a pile G feet long, F feet wide, and E feet high?
259. What is the value of a pile of wood H feet long, G feet wide, and E feet high, at F dollars per cord?
260. How long must a pile of wood be which is E feet high and F feet wide, to contain H cords?
261. Reduce to whole numbers of lower denominations A of 1 cwt.
262. Reduce to whole numbers of lower deno. A of 1 sq. rd
263. A of 1 gal. + B of 1 qt.
264. A of 1 mile + B of 1 fur + C of 1 rd.
265. A of 1 bush. — B of 1 pk
266. A of 1 cu. yd. — B of 1 cu. yd.

REDUCTION.

	A	B	C	D
1.	Pounds.	Pence.	Shillings.	Farthings.
2.	Pounds.	Pwts.	Grains.	Ounces.
3.	Pounds.	Scruples.	Ounces.	Grains.
4.	Tons.	Pounds.	Drams.*	Cwt.(100 lb.)
5.	Yards.	Nails.†	Inches.	Quarters.
6.	Miles.	Yards.	Furlongs.‡	Inches.
7.	Miles.	Links.	Inches.	Chains.
8.	Acres.	Sq. yards.	Sq. inches.	Sq. rods.
9.	Cords.	Cu. feet.	Cord feet.	Cu. inches.
10.	Gallons.	Pints.	Quarts.	Gills.
11.	Bushels.	Quarts.	Pecks.	Pints.
12.	Years.§	Hours.	Seconds.	Days.

* 16 dr. = 1 oz.

† 2½ in. = 1 nail; 4 nails = 1 qr.; 4 qrs. = 1 yd.

‡ 8 furlongs = 1 mile.

§ 365¼ days = 1 year.

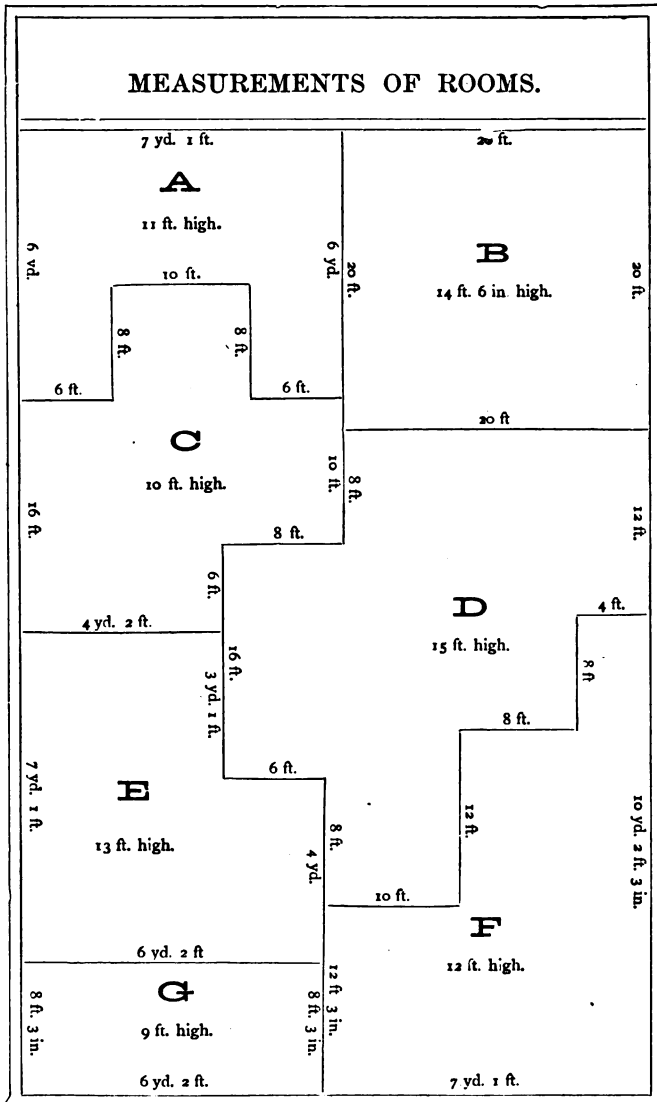
DECIMALS.

	E	F	G
1.	.025	Twenty-five and two thousandths.	5000.
2.	25.75	Two hundred six ten-thousandths.	1.648
3.	.3504	Seven hundred and eight tenths.	.657
4.	1.01	404 hundred-thousandths.	.002½
5.	250.	505050 ten-thousandths.	.005
6.	.0008	Eight and ninety-six hundredths.	448.
7.	16.005	Five thousand five hundredths.	2.5
8.	8000.	Sixteen hundred-thousandths.	.008
9.	5.6	One hundred twelve millionths.	1.68
10.	.12½	One hundred twenty-two thousand.	24.40
11.	1.015½	Eight units and 4½ hundredths.	.0002½
12.	8.33½	Five hundred units and ⅔ tenths.	1.071½

EXERCISES.

H			
1.	$\frac{7}{125}$	267. Change 248 in A to B.	286. Multiply E by 10; divide F by 100; add the results to G.
2.	$\frac{19}{32}$	268. Change 348 in A to B.	287. Multiply G by $\frac{1}{10}$, and add to the product the sum and difference of E and F.
3.	$\frac{139}{2500}$	269. Change 29765 in B to A.	288. Divide F by $\frac{1}{100}$; multiply G by 10, and add the results to E plus 375 tenths.
4.	$\frac{3}{2000}$	270. Change 39765 in B to A.	289. Difference, E and F.
5.	$\frac{23}{40}$	271. Change 4268 in B to C.	290. Difference, E and G.
6.	$\frac{1}{400}$	272. Change 20936 in C to B.	291. Difference, F and G.
7.	$\frac{463}{3125}$	273. Change 702-500 in C to D.	292. Difference, column E, 1st and 2d; 2d and 3d; etc.
8.	$\frac{18}{16}$	274. Change 50256 in D to C.	293. Difference, column F, 1st and 2d; 2d and 3d; etc.
9.	$\frac{37}{160}$	275. Change 32-004075 in C to A.	294. Difference, column G, 1st and 2d; 2d and 3d; etc.
10.	$\frac{9}{128}$	276. Change 2604-148 in D to A.	295. Multiply E by F.
11.	$\frac{32}{500}$	277. Change 32 in A and 16 in B to the lowest denomination in each table.	296. Multiply E by G.
12.	$\frac{17}{16}$	278. Change 56 in A and 12 in C to the lowest denomination in each table.	297. Multiply F by G.
13.	$\frac{27}{80}$		298. Multiply the 1st in E by the 2d; the 2d by the 3d; etc.
14.	$\frac{7}{8}$		299. Multiply the 1st in F by the 2d; the 2d by the 3d; etc.
15.	$\frac{21}{250}$		300. Multiply the 1st in G by the 2d; the 2d by the 3d; etc.
16.	$\frac{19}{13}$		301. Divide E by F.
17.	$\frac{1}{89}$		302. Divide E by G.
18.	$\frac{780}{1}$		303. Divide F by G.
19.	$\frac{21}{1}$		304. Divide F by E.
20.	$\frac{12}{1}$		305. Divide G by E.
21.	$\frac{17}{16}$		306. Divide G by F.
22.	$\frac{14}{1}$		307. Change 2 B, 1 C to dec. of A.
23.	$\frac{18}{1}$		308. Change 2 C, 1 D to dec. of A.
24.	$\frac{1}{22}$		309. Change E to equiv. common fractions in lowest terms.
25.	$\frac{24}{1}$		310. Change G to equiv. common fractions in lowest terms.
			311. Change .704 in A to units of lower denominations.
			312. Change .096 in A to units of lower denominations.
			313. Change H to equiv. decim.
			314. Change H yards to the decimal of a rod.

MEASUREMENTS OF ROOMS.



EXERCISES.

EXERCISE 315.

1. What is the distance in feet around room A?
2. What is the distance in yards around room D?
3. What is the distance in inches around room F?
4. How many square feet in the floor of room A?
5. How many square yards in the floor of room B?
6. How many square yards in the floor of room D?
7. How many square inches in the floor of room C?
8. How many square feet in the floor of room G?
9. How many square feet in the south wall of room G?
10. How many square yards in the walls of room B?
11. How many cubic feet in room E?
12. How many cubic yards in room A?
13. How many bushels of grain will a bin contain whose dimensions are the same as those of room B? (2150.4 cubic inches = 1 bush.)
14. How many gallons of water will a cistern hold whose dimensions are the same as those of room G? (231 cubic inches = 1 gal.)
15. How many square feet in the west wall of room A, there being two windows, each 6 ft. by 3 ft.?
16. How many square yards in the east wall of room F, there being three windows, each 6 ft. by 3 ft. 4 in., and one door 8 ft. by 3 ft.?
17. How many rolls of paper, 21 inches wide and 9 yards long, will it take to cover the walls of room E, no allowance being made for doors and windows?
18. How many square yards of carpeting will cover the floors of rooms A and C?
19. How many yards of carpeting, two yards in width, will be required to carpet rooms D and F?
20. How many yards of carpeting, three fourths of a yard wide, will carpet room C?
21. At \$60 per M. what is the cost of boards for the floor of room B?
22. How much will it cost at \$2.50 a yard, for carpeting a yard wide, to carpet room F?
23. How much will it cost to carpet room E, with carpeting one and a half yards wide, at \$4 per yard?
24. How many more square yards of carpeting will be required for rooms B, D, and F, than for rooms A, C, E, and G?
25. How many more square yards of carpeting will it be necessary to buy to carpet room B with carpeting one yard wide, than with carpeting three fourths of a yard wide; no allowance being made for matching, and no breadth being divided?

PERCENTAGE.

	A	B	C	D . E	
	PRINCIPAL.	INTEREST.	TIME.	PER CENT.	
1.	\$640.08	\$16.305	1y. 6m. 24d.	5	$\frac{1}{3}$
2.	\$305.40	\$28.14	1y. 2m. 6d.	8	$\frac{3}{4}$
3.	\$90.508	\$17.083	4y. 11m.	3	$\frac{2}{5}$
4.	\$705.38	\$78.90	3y. 7m. 27d.	2	$\frac{3}{3}$
5.	\$4000.	\$100.	2y. 3m. 20d.	7	$\frac{1}{4}$
6.	\$240.08	\$50.40	4y. 9m. 5d.	4	$\frac{1}{2}$
7.	\$9.034	\$15.08	7y. 5m. 18d.	11	$\frac{3}{5}$
8.	\$80.50	\$7.005	2y. 11m. 26d.	1	$\frac{7}{8}$
9.	\$3050.	\$430.20	3y. 10m. 3d.	10	$\frac{5}{8}$
10.	\$560.08	\$6.095	17d.	9	$\frac{1}{5}$
11.	\$150.20	\$30.75	1y. 3m.	12	$\frac{1}{8}$
12.	\$5400.	\$175.60	1y. 4m. 25d.	3	$\frac{4}{5}$
13.	\$690.40	\$290.14	5y. 21d.	2	$\frac{3}{5}$ of 1
14.	\$60.75	\$5.872	1y. 9d.	9	$\frac{1}{2}$ of 1
15.	\$850.06	\$25.642	10m. 13d.	5	$\frac{3}{4}$ of 1
16.	\$.6508	\$11.75	5y. 7m. 2d.	11	$\frac{1}{5}$ of 1
17.	\$700.01	\$10.90	2m. 28d.	10	$\frac{1}{3}$ of 1
18.	\$38.20	\$3.956	2y. 8m. 19d.	1	$\frac{2}{5}$ of 1
19.	\$590.04	\$105.20	3m. 16d.	4	.4
20.	\$11.80	\$5.769	4y. 8m. 2d.	8	.1
21.	\$809.06	\$340.50	2y. 15d.	7	.5
22.	\$654.09	\$75.80	4y. 4d.	12	.0 $\frac{1}{2}$
23.	\$10000.	\$500.	4m. 14d.	50	.06
24.	\$3600.	\$1640.	1d.	100	.08
25.	\$908.70	\$64.37	1y. 7m. 15d.	7	.3

EXERCISES.

316. Find D per cent. of A.
317. Find E per cent. of A.
318. Find DE per cent. of B.
319. A is D per cent. of what sum?
320. A is E per cent. of what sum?
321. B is what per cent. of A?
322. Find the commission for collecting or investing A at $(D - E) \%$.
323. If A includes both the commission and sum to be invested, what is the commission at D %?
324. If A includes both the commission and sum to be invested, what is the sum to be invested, the commission being D %?
325. Find the date, which is C years, months, and days after Nov. 27, 1871.
326. Find the interest of \$1 at 6 %, for the time in C.
327. Find the interest of \$1 at 1 %, for the time in C.
328. Find the interest of \$1, at D %, for the time in C.
329. Find the interest of \$1, at E %, for the time in C.
330. Find the interest of \$1, at DE %, for the time in C.
331. Find the interest of A, at D %, for the time in C.
332. Find the interest of A, at DE %, for the time in C.
333. Find the amount of A, at 6 %, for the time in C.
334. Find the compound interest of A, at D %, for 2 yr. 9 mo. 18 d.
335. Find the compound interest of A, at D %, for 1 yr. and the months and days in C, interest payable semi-annually.
336. Find the amount of A, at compound interest, for 2 yr. 6 mo. 15 d., at 6 %.
337. Find the rate, A, B, C, being given.
(Let the fraction of the per cent. be changed to tenths, and the answer be expressed thus: 8.3 % +.)
338. Find the time, A, B, DE, being given.
339. Find the principal, B, C, D, being given.
340. Find the principal, A considered as amount, C, 6 %, being given.
341. Find the present worth of A, due in the time in C, at D %.
342. Find the discount on A, due in the time in C, at D %.
343. Find the discount on A, due in the time in C, at 6 %.
344. Find the bank discount on a note for A, payable in the months and days in C, at D %.
345. Find the avails of a note for A, payable in the months and days in C, at D %.
346. Find the face of a note, which, being discounted at a bank at 6 %, for the months and days in C, will yield A.

REVIEW IN FRACTIONS.

EXERCISE 347.

1. What are the prime factors of 296?
2. Divide $2 \times 15 \times 14 \times 54$ by $4 \times 16 \times 35 \times 9$.
3. What is the greatest common divisor of 180, 600, 92?
4. What is the least common multiple of 72, 36, 90?
5. Reduce $\frac{3}{8}\frac{1}{4}$ to its lowest terms.
6. Reduce $647\frac{1}{2}\frac{1}{8}$ to an improper fraction.
7. Reduce $\frac{2}{3}\frac{8}{4}\frac{6}{8}$ to a whole or mixed number.
8. Reduce $\frac{1}{2}$ of $\frac{1}{4}\frac{1}{8}$ of $8\frac{1}{2}$ of $\frac{9}{16}$ to a simple fraction.
9. Reduce $\frac{7}{2}$, $\frac{4}{3}$, $1\frac{1}{2}$ to the L. C. denominator.
10. What is the sum of $\frac{1}{2}$ of $\frac{2}{3}$, $\frac{8}{9}$, $1\frac{2}{3}$?
11. Add $64\frac{2}{4}$, $115\frac{3}{4}$, $35\frac{1}{2}$.
12. From $\frac{1}{2}$ of $6\frac{2}{3}$ take $\frac{1}{3}$.
13. From $308\frac{1}{2}$ subtract $165\frac{7}{8}$.
14. Multiply $\frac{5}{8}$ by $7\frac{1}{8}$.
15. Divide $\frac{5}{12}$ of $\frac{8}{15}$ by $\frac{1}{4}\frac{1}{8}$ of 9.
16. If 42 is $\frac{4}{5}$ of a number, what is $\frac{5}{7}$ of the same number?
17. Reduce $\frac{4\frac{1}{2} + \frac{3}{8} \div \frac{7}{8} \times 3\frac{1}{2}}{\frac{3}{4} \text{ of } \frac{1}{9} - \frac{1}{11} - \frac{1}{2}}$ to its simplest form.
18. What is the greatest common divisor of $3\frac{2}{3}$ and $2\frac{2}{3}\frac{1}{4}$?
19. What is the least common multiple of $\frac{1}{5}$, $\frac{6}{4}$, $1\frac{1}{2}$?
20. What part of a foot is $\frac{2}{8}\frac{2}{4}\frac{1}{10}$ of a furlong?
21. What part of an acre is $\frac{5}{6}$ of a sq. foot?
22. What is the value of $\frac{2}{6}$ of a bushel?
23. What part of a ton is 2 cwt. 6 lb. $9\frac{1}{2}$ oz.?
24. Add $\frac{1}{9}\frac{2}{8}$ of a cu. yard, and $\frac{1}{12}\frac{3}{2}$ of a cu. foot.
25. From $\frac{1}{4}\frac{2}{8}$ of a day take $\frac{1}{2}\frac{2}{8}$ of an hour.

By changing the figure 2 or 9 to any other figure new problems can be obtained.

THE 2 OR 9 CHANGED.

348. 2 to 3.	353. 2 to 8.	358. 9 to 5.
349. 2 to 4.	354. 2 to 9.	359. 9 to 4.
350. 2 to 5.	355. 9 to 8.	360. 9 to 3.
351. 2 to 6.	356. 9 to 7.	361. 9 to 2.
352. 2 to 7.	357. 9 to 6.	

REVIEW IN PERCENTAGE.

EXERCISE 362.

1. What is $\frac{1}{2}$ % of \$604.80?
2. \$75.60 is 2 % of what sum?
3. What is the amount of \$149.60 for 3 yr. 5 mo. 12 d., at 9 %.
4. What is the interest of £38 2s. 6d. for 9 mo. 18 d., at 2 %.
5. A note of \$5200, dated Mar. 30, 1869, has the following indorsements: Nov. 6, 1869, \$194.40; Sept. 18, 1871, \$200; what was due Aug. 15, 1873? (See note p. 31.)
6. If \$540 gain \$36 in 2 yr. 4 mo., what is the rate %.
7. In what time will \$280 gain \$14.50, at 2 %?
8. What principal, at 3 %, will gain \$25.48 in 4 yr. 2 mo.?
9. What principal, in 3 yr. 7 mo. 15 d., at 2 %, will amount to \$280.75?
10. What is the compound interest of \$750 for 1 yr. 2 mo., at 2 %, interest payable semi-annually?
11. What is the present worth of \$500, due in 2 yr. 15 d., at 6 %.
12. What is the discount on \$80.64, due in 2 yr., at 8 %.
13. My agent has sold goods to the amount of \$200; what sum should he remit to me, his commission being $3\frac{1}{2}$ %.
14. Sent \$2000 to a broker for the purchase of cotton; what is left for investment after deducting his commission of $\frac{3}{4}$ %?
15. What is the value of 28 shares bank stock, at $7\frac{1}{2}$ % discount, the par value of each share being \$150?
16. What are the avails of a note for \$480, payable in 87 days, discounted at a bank at 2 %?
17. What is the bank discount on a note for \$350, due in 25 days, at 7.3 %?
18. For what sum must a note, payable in 4 months, be given at a bank to obtain \$200, discount being 6 %?
19. A store worth \$2840 is insured for $\frac{3}{4}$ its value, at .9 of 1 %; what is the premium?
20. What is the duty, at 9 cents per lb., on 20 bags of coffee, weighing 190 lbs. each, tare 3 %?

By changing the figure 2 to any other figure new problems can be obtained.

THE 2 CHANGED.

363. 2 to 3.	366. 2 to 6.	368. 2 to 8.
364. 2 to 4.	367. 2 to 7.	369. 2 to 9.
365. 2 to 5.		

MISCELLANEOUS EXERCISES.

- | | | |
|-----------|---------|--|
| Examples. | A | 370. There are two outlets to a cistern; by one |
| | x y | x gallons, and by the other y gallons, can be emptied |
| 1. | 9 8 | in one minute; how many gallons will be emptied |
| 2. | 9 0 | by both outlets in A minutes? |
| 3. | 6 7 | 371. A man bought a farm for x thousand dollars; |
| 4. | 3 6 | he paid A dollars for fencing and other improve- |
| 5. | 1 5 | ments, and then sold it for \$384 less than he had |
| 6. | 8 8 | expended; what did he receive for it? |
| 7. | 8 0 | 372. How many barrels of apples at x dollars per |
| 8. | 9 1 | barrel will pay for A cords of wood at y and $\frac{1}{4}$ dol- |
| 9. | 9 2 | lars per cord? |
| 10. | 9 5 | 373. The product of three numbers is A ; the first |
| 11. | 6 6 | number is x , the second is y and $\frac{1}{4}$; what is the third? |
| 12. | 7 2 | 374. Change A and $\frac{1}{3}$ to a fractional number (im- |
| 13. | 8 4 | proper fraction). |
| 14. | 1 4 | 375. Find the prime factors of A . |
| 15. | 2 2 | 376. A rent for 48 weeks was A dollars; what was |
| 16. | 1 9 | the rent for 4 weeks and 4 days at the same rate? |
| 17. | 9 4 | 377. At $\frac{x}{12}$ of a dollar each how many loaves can |
| 18. | 7 9 | be bought for A dollars? |
| 19. | 7 3 | 378. What is that number to which if $\frac{1}{5}$ of itself |
| 20. | 3 2 | be added, the sum will equal A ? |
| 21. | 8 2 | 379. If a man travels 2 miles 64 rods in A minutes, |
| 22. | 7 6 | what part of a mile does he travel in one minute? |
| 23. | 1 0 | 380. What will 18 bu. 3 pk. 4 qt. of grain cost at |
| 24. | 8 7 | A cents per bushel? |
| 25. | 4 4 | 381. If a family consume $\frac{3}{4}$ of a barrel of flour |
| | x y | in a month, in how many months will they consume |
| | | A tenths barrels? |
| | | 382. How many spoons, each 2 oz. 8 pwt., can |
| | | be made out of A lbs. of silver? |
| | | 383. How much fencing will be required to fence |
| | | the front of A lots of land, each 10 rd. 8 ft. 3 in.? |
| | | 384. At 9 mills on a dollar, a tax on what valua- |
| | | tion can be paid with A dollars? |
| | | 385. Divide A tenths by .018. |
| | | 386. What must be the length in yards of a piece |
| | | of cloth which is A inches wide, that it may contain |
| | | 6 square yards? |
| | | 387. In what time will \$350, on interest at 6 %, gain A dollars? |
| | | 388. How many miles an hour must a steam car go |
| | | to cross the continent, 2800 miles, in 7 and $\frac{x}{12}$ days |
| | | of 24 hours each, allowing $x + y$ hours for stops? |
| | | 389. What % should I lose by buying stock at |
| | | 25 % advance and selling it at A % of its par value? |

* See notes on page 9.

MISCELLANEOUS EXERCISES.

Examples.	B			
	x	y	z	
				390. If a man earns \$112 per month and spends \$77 in the same time, how long will it take him to save B dollars?
1.	9	8	7	391. After paying for $2\frac{1}{2}$ pounds of tea at 70 cents per pound I have B cents remaining; how many cents had I at first?
2.	9	0	5	392. My gas bill was B cents per month; if this was $\frac{1}{4}$ more than the cost of my oil, what was the cost of my oil?
3.	6	7	9	393. Change B gills, liquid measure, to pints, quarts, etc.
4.	3	6	9	394. At $\frac{x}{12}\%$ a month what will be the cost of insuring B dollars' worth of goods for x and $\frac{2}{3}$ mos.
5.	1	5	3	395. Multiply B by $2\frac{1}{2} \div 1\frac{1}{2}$.
6.	8	8	8	396. Divide B by $2\frac{1}{2} \div 1\frac{1}{2}$.
7.	8	0	6	397. Find the simple interest of B dollars for 2 yr. 4 mo. 12 da., at 6 %.
8.	9	1	7	398. Bought pens at x dollars per hundred, and sold them at z cents apiece; what per cent did I gain or lose?
9.	9	2	7	399. Change x oz. z pwt., troy weight, to the decimal of a pound.
10.	9	5	3	400. Find the simple interest of B dollars for 1 yr. 3 mo., at 7 %.
11.	6	6	7	401. Find the simple interest of B dollars for 15 days, at $7\frac{3}{10}\%$.
12.	7	2	8	402. Find the amount, at simple interest, of B dollars, from Oct. 26, 1866, to May 5, 1867, at 6 %.
13.	8	4	5	403. Find the amount of B dollars, at simple interest, from Jan. 11, 1865, to Oct. 4, 1867, at 8 %.
14.	1	4	4	404. Find the compound interest of B dollars for 1 yr. 6 mo., at 6 %.
15.	2	2	5	405. What principal, in 8 months, at 6 %, will yield B dollars of interest?
16.	1	9	9	406. What principal will amount to B dollars in 8 months, at 9 %?
17.	9	4	1	407. What is the true present worth of B dollars, due in 5 months, discounting at 6 %?
18.	7	9	5	408. Find the true discount of B dollars for 6 months, at 7 %.
19.	7	3	4	409. If a note for B dollars is discounted at a bank for 17 days and grace, at $7\frac{3}{10}\%$, what will the holder of the note receive?
20.	3	2	3	410. What must be the face of a note which is to be discounted at a bank for 60 days and grace, at 6 %, that the avails shall be B dollars?
21.	8	2	4	
22.	7	6	9	
23.	1	0	8	
24.	8	7	2	
25.	4	4	4	
	x	y	z	

MISCELLANEOUS EXERCISES.

Examples.	A*	
	$\overbrace{B}$	
1.	3 1 7	411. At $37\frac{1}{2}$ cents an hour what will a compositor earn in x years y days z hours, working 10 hours a day for 300 days a year?
2.	9 9 5	412. If B pounds of sugar cost $\$2\frac{1}{2}$, what will 1 barrel of 246 lbs. cost?
3.	8 7 2	413. What will be gained by buying B barrels of apples at $\$2\frac{1}{2}$ per barrel, and selling them at $\$5.10$ per barrel?
4.	3 2 7	414. How many blocks of granite 1 foot square will pave a court B yards square?
5.	4 3 6	415. Change $\frac{A}{25}$ to a mixed number.
6.	2 1 6	416. Change x rods y yards z feet to inches.
7.	5 0 3	417. Considering x as pounds, y as ounces, z as drams, avoirdupois weight, add 1 to $\overline{4}$, $\overline{2}$ to $\overline{5}$, etc.
8.	8 4 2	418. Divide x lbs. y oz. z gr., apoth. weight, by 8.
9.	4 7 1	419. What is the difference of time between two places, the difference of whose longitude is $x^\circ y' z''$?
10.	1 7 4	420. Divide B thousandths by 6.25.
11.	8 6 2	421. If the interest of $\$1$ for a certain time is $\frac{A}{1000}$ of a dollar, what is the interest of $\$9.87$ for the same time? (Ans. in full.)
12.	3 5 4	422. Change $\frac{B}{125}$ to a decimal.
13.	5 3 4	423. In what time will A dollars, on interest at 8 %, gain $\$128$?
14.	1 1 1	424. What principal, on interest for 2 years at 8 %, will yield A dollars?
15.	1 9 7	425. My agent has sold goods for me amounting to A dollars; what sum should he remit to me, his commission being $2\frac{1}{2}$ %?
16.	4 9 0	426. What insurance policy will cover A dollars and a premium of 1 %?
17.	8 7 6	427. How many square inches in the surface of a cube whose diagonal is B inches?
18.	9 0 2	428. What is the value, in U. S. money, of A pounds sterling, exchange being $9\frac{1}{2}$ % advance upon the nominal value?
19.	3 9 6	429. If there are x hundred pounds of hay in a stack $8\frac{1}{2}$ ft. high, how many pounds are there in a similar stack 10 and $\frac{7}{8}$ ft. high? (Ans. in dec.)
20.	4 8 4	430. There is a tree standing upon a horizontal plain. A kite line 250 feet long reaches from the top of this tree to a point on the ground B feet from the foot of the tree; what is the height of the tree?
21.	2 3 5	
22.	3 8 7	
23.	8 9 7	
24.	6 2 4	
25.	4 7 6	
	$x y z$	

* A stands for the number expressed under the large brace, B for the number expressed under the small brace.

MISCELLANEOUS EXERCISES.

Examples.	C	
	D	
1.	9 8 7	431. What part of $112\frac{1}{2}$ is D?
2.	4 2 5	432. Paid C dollars for x sq. rd. y sq. yd. z sq. ft. of land; what was paid per square foot?
3.	6 7 2	433. Divide x years y days z hours by 24 ($365\frac{1}{4}$ days = 1 year).
4.	3 0 7	434. What is my latitude when I am $x^\circ y' z''$ from the pole?
5.	2 1 6	435. Multiply 200 d. 15 h. by D. ($365\frac{1}{4}$ d. = 1 yr.)
6.	3 2 1	436. Multiply C ten-thousandths by .475.
7.	1 1 1	437. Change $\frac{D}{3\frac{1}{2}}$ acre to rods, yards, etc.
8.	8 7 2	438. Multiply C thousandths by 100, divide the product by 10, divide this quotient by 10, multiply this quotient by 1000, and add the four results.
9.	5 6 4	439. C ten-thousandths + .66 $\frac{2}{3}$ equals what common fractional number?
10.	8 7 6	440. If the interest on a note is D dollars for x yr. y mo., what would the interest be for y yr. z mo.?
11.	3 1 8	441. What is the cost of D boards, each 12 ft. long $x + y$ inches wide, at \$24 per thousand?
12.	4 1 9	442. The difference of $\frac{x}{1\frac{1}{2}}$ and $\frac{1}{4}$ of $\frac{2}{3}$ of a certain number is D; what is the number?
13.	1 8 7	443. How much water must be mixed with D gallons of brandy worth \$4, that the mixture may be worth \$3?
14.	1 6 0	444. What is the compound interest of C dollars for 1 yr. 7 mo., interest compounding semi-annually, at 6 % per annum?
15.	8 7 5	445. What is the value of D shares of stock at $9\frac{1}{2}$ % discount, the par value of each share being \$45.
16.	2 8 4	446. What was the cost of an article which, selling at 20 % below cost, brought C dollars?
17.	2 9 4	447. By selling cloth at D cents a yard less than cost a tailor lost 12 %; what was the cost of x yd.?
18.	8 9 6	448. A note for C dollars is dated Sept. 15, 1875, and payable in 3 months; what would be the avails of this note at a bank, Nov. 20, 1875, discounting at 6 %?
19.	5 1 7	449. What would be the true discount of the above note at its date, discounting at 6 %?
20.	8 9 4	450. What would be the bank discount of the above note at its date, discounting at 6 %, and allowing grace (3 mo. 3 da.)?
21.	2 8 7	451. What would be the cash value of the above note, Jan. 1, 1876, at 6 %? (No grace.)
22.	4 0 6	452. $(x \text{ tenths})^3 + (\frac{x}{30})^2$ equals what decimal?
23.	7 1 6	
24.	8 7 2	
25.	5 7 4	
	$x y z$	

MISCELLANEOUS EXERCISES.

Examples	A	
	B	
1.	9 1 5	453. If A men, working x hours per day, can do a piece of work in 9 months, in what time can B men, working 10 hours per day, do the same work?
2.	8 7 5	454. At $11\frac{1}{2}$ cents a yard how many yards of cloth can be bought with the proceeds of B trees sold at $7\frac{3}{4}$ cents each?
3.	1 1 7	455. If by selling an article for B dollars I lost $\frac{x}{10}$ of its cost, what did it cost?
4.	8 6 8	456. What will be the cost of carpeting, at B cents per yard, for a staircase consisting of $x+y+z$ stairs, each 8 inches rise and 10 inches flat, allowing $1\frac{1}{2}$ yards from the edge of the upper stair for the landing?
5.	5 7 5	457. What part of B is $14\frac{3}{4}$?
6.	3 8 7	458. How many buttons, each requiring x grains of gold, can be plated with y oz. z pwt. of gold?
7.	6 9 4	459. Find the difference of A tenths and A millionths.
8.	9 4 6	460. The ratio of the circumference to the diameter of a circle being $3\frac{1}{2}$, what is the circumference of a circle whose diameter is B thousandths of a foot?
9.	6 4 9	461. If \$1, discounted at a bank for a certain time, yields \$.97 $\frac{1}{4}$, how many dollars must be discounted to yield A dollars?
10.	8 0 7	462. Change A thousandths of a mile to rods, yards, etc.
11.	2 0 6	463. If 1 long ton, 756 lbs. of coal cost A cents, what is the cost of 1 ton of 2000 lbs.?
12.	5 2 6	464. How many bushels, pecks, etc., in 8 % of A bushels?
13.	8 4 9	465. What per cent. should I gain by selling an article for \$1 which cost B cents?
14.	2 1 6	466. What must I have paid for cloth which I sell at \$1.50 per yard, and thereby gain B %?
15.	4 5 4	467. What must I have paid for cloth which I sell at \$1.50 per yard, and thereby lose B %?
16.	5 7 5	468. I sent to my agent A dollars; what sum remains for investment after deducting his commission of 2 %?
17.	1 8 0	469. The tax of a town is \$16,800; the valuation of the town is \$2,700,000; there are 400 polls taxed \$1.50 each. What is the tax on A dollars?
18.	5 9 4	470. The face of a note is A dollars, the date Jan. 20, 1876; if the note is on interest from date, and a payment of \$90 dollars is made July 14, 1876, what will be due Jan. 20, 1877? (Int. 6%)
19.	8 0 6	
20.	5 1 6	
21.	4 9 9	
22.	3 6 4	
23.	7 6 2	
24.	8 9 8	
25.	4 5 7	
	$x y z$	

MISCELLANEOUS EXERCISES.

Examples.	x	y	z	
		$\cdot C$		
		$\sim$		
		D		
		$\sim$		
		x	y	z
1.	4	4	9	471. Find the cost of a desk, the cost of stock being x and $\frac{x}{12}$ dollars, of trimmings $\frac{y}{8}$ dollars, of making, z and $\frac{z}{10}$ dollars.
2.	7	8	8	472. How many powders of $x + y$ grains each, in x oz. y dr. z sc. of quinine?
3.	4	3	5	473. In x floors, each y and $\frac{1}{2}$ yds. long, z and $\frac{1}{4}$ yds. wide, how many square yards?
4.	6	6	3	474. For what must I sell a hat which cost \$85, to gain D %?
5.	9	6	7	475. What part of 1 mile, expressed decimally (to four places), remains after x rds. y yds. and z ft. of it have been subtracted?
6.	4	5	5	476. How much cloth, y and $\frac{1}{2}$ yds. wide, will line 1 and $\frac{x}{5}$ yds. that is $\frac{x}{5}$ yds. wide?
7.	3	9	9	477. What is the value in English money of C dollars, exchange being 20 % advance?
8.	5	1	7	478. At what rate % will \$400, in 3 years, gain D dollars?
9.	9	3	1	479. Suppose, on a note for C dollars, on interest at 7 % from Nov. 25, 1865, a payment of \$12 was made July 1, 1866, and another of \$150, Sept. 13, 1866, what was due Dec. 26, 1866?
10.	2	0	5	480. How many blocks of granite, each containing y and $\frac{2}{3}$ cubic feet, at $\frac{x}{12}$ dollars per cubic foot, can be bought for x dollars?
11.	8	7	1	481. 25 and $\frac{x}{10} - (y \text{ and } \frac{y}{5} + z \text{ and } \frac{z}{18}) = ?$
12.	4	3	1	482. A wall can be built by N . in x days, by T . in y and $\frac{1}{2}$ days, and by W . in z days; in what time can it be built by all together?
13.	2	1	9	483. At \$10 per M , what is the cost of bricks to construct a wall x rds. long, x ft. y in. high, and 1 ft. z in. thick, allowing $\frac{1}{8}$ for mortar?
14.	8	6	8	484. Find the equated time in months and days for paying \$430 due in x months, \$270 due in y months, and \$300 due in z months.
15.	1	8	9	485. How many feet of lead will be required to line the bottom and sides of a cistern x ft. long, y ft. deep, and z feet wide? (Put 3 for y in Ex. 10.)
16.	5	9	8	486. How many gallons (231 in.) in the above?
17.	5	2	9	487. Two persons received D dollars for teaming flour; the first teamed x loads of 10 barrels each, the second z loads of 8 barrels each; w'at should each receive? (Preserve frac. in Ans.)
18.	7	2	1	488. How many feet of boards, 1 in. thick, will be required to make a box x ft. long, 5 ft. y in. high, and z ft. wide, outside measure?
19.	2	5	6	
20.	5	8	3	
21.	1	7	4	
22.	4	1	6	
23.	8	2	4	
24.	8	9	2	
25.	7	6	4	
	x	y	z	

MISCELLANEOUS EXERCISES.

Examples.	A	
	B	
	$wxyz$	
1.	9874	489. What part of 15 days is y da. z h.?
2.	9057	490. Change B pounds avoird. to pounds, etc., Troy. (1 lb. av. = 7000 gr. Troy.)
3.	6794	491. Two places differ in time x h. y min. z sec.; what do they differ in longitude?
4.	3696	492. What will be the cost of a lot of land B rods long, z rods wide, at 4 cts. per sq. ft.?
5.	1539	493. A lot of land y yds. long, z yds. wide, cost \$604.80; what was the price per sq. ft.?
6.	8884	494. A rectangular piece of marble contains 1 cu. ft.; one side is y in. long, z in. wide; find the other dimension in ft. and in.
7.	8063	495. Sold cloth at B cents per yard, and thereby lost y %; for what should I have sold it to gain z %? (Preserve the fractions.)
8.	9175	496. A house valued at A dollars is insured for $\frac{2}{3}$ of its value, at .6 %; what is the prem.?
9.	9279	497. Having loaned money at w %, I was paid, at the expiration of y mo., principal and interest, E dollars; what sum was loaned?
10.	9532	498. Hired E dollars at 5 %, which I invested so that it paid me at the rate of $1\frac{1}{4}$ % a month; how much did I gain in w yrs. x mos. y da.?
11.	6678	499. For E dollars what amount of goods can I buy and reserve to myself a commission of y % on the purchase?
12.	7284	500. What remains due on a note for E dollars, on interest at 10 %, if \$30 is paid at the end of w mo., of x mo. 24 da., and of y da.?
13.	8452	501. At what price must I purchase bank stock, which pays w % on the par value of \$100, that I may obtain y % on my investment?
14.	1448	502. The capital stock of a bank is E thousand dollars; a revenue tax of 5 % is assessed on the sum set aside to pay the dividend; if the dividend is y %. what is the sum set aside?
15.	2251	503. $\sqrt{A}$ thousandths = ? (3 dec. places.)
16.	1995	504. $\sqrt[3]{A}$ ten thousandths = ? (4 dec. pl.)
17.	9415	505. How many feet to the hundred must a road rise which is to be w miles long, and to be carried to an elevation of A feet?
18.	7957	506. If in gunpowder 75 % is nitre, if there is 25 % as much charcoal as nitre, and $33\frac{1}{4}$ % as much sulphur as charcoal, what weight of each is there in B tons of powder?
19.	7342	507. 24 thalers equal 36 florins, and 25 florins equal \$12, how many dollars equal B thalers?
20.	3235	
21.	8241	
22.	7694	
23.	1088	
24.	8728	
25.	4447	
	$wxyz$	
	E	

MISCELLANEOUS EXERCISES.

Examples.	C				D	w	x	y	z	
	w	x	y	z						
1.	7	1	8	4						508. At 11 and $\frac{x}{10}$ cts. per pound for cheese, what is the value of the cheese which can be made from C pounds of milk, if 2 pounds of cheese can be made from 19 pounds of milk.
2.	5	3	3	7						509. What part of 1 cord, 1 cord foot, is w cord feet x cubic feet of wood?
3.	2	6	9	2						510. Change C ten thousandths of a ton to pounds, with oz. and dr.
4.	7	4	7	6						511. What must be the depth in rd., ft., and in. of a rectangular lot of land x and $\frac{y}{10}$ rods wide, that it may contain .25 acre?
5.	6	2	0	8						512. What is the height of a steeple whose shadow was D ft. x in. long at the same time of day that the shadow of a staff 10 ft. high was x and $\frac{x}{16}$ ft. long?
6.	6	3	5	6						513. What is the interest of w pounds, x shillings, y pence, for x yrs. y mos., at 5 %?
7.	3	5	7	5						514. At 12 % what is the amount of C dollars at compound interest for w + x months, interest payable quarterly?
8.	2	9	9	3						515. The circumference of the forward wheel of a carriage is D inches, and of the hind wheel 120 inches; at a certain time a particular spoke in each wheel is pointing vertically upward from the hub; how many rods will the carriage go before the same spokes will have the same relative position again?
9.	1	8	8	8						516. The standard thickness of a brick wall is $1\frac{1}{2}$ bricks (12 inches); how many sq. rods of bricks, standard thickness, in a wall D yds. long, x ft. high, $2\frac{1}{2}$ bricks thick?
10.	4	4	4	7						517. How many feet of stair rail will be required for a flight of D stairs, each step 9 in. high, 12 in. deep?
11.	2	2	0	6						518. What must be the diameter of a circular pond that the surface may contain C sq. ft.?
12.	4	4	1	7						519. How many cubic feet are there in a globe whose diameter is w ft. x in.?
13.	4	6	2	1						520. How many sq. ft. are there in the surface of a globe whose diameter is w ft. x in.?
14.	1	5	8	4						521. What must be the diameter of a globe that it may contain D cubic ft.?
15.	7	2	9	0						522. How many inches in depth must rain have fallen, if a circular cistern 3 and $\frac{w}{10}$ ft. in diameter was filled x + y + z ft. by the rain which fell upon a flat roof 80 ft. square? (4 decimal places.)
16.	0	9	4	0						
17.	6	7	0	0						
18.	2	2	9	8						
19.	6	4	7	5						
20.	4	6	2	7						
21.	5	5	8	6						
22.	7	2	1	9						
23.	7	9	8	4						
24.	4	7	6	8						
25.	6	5	1	1						
	w	x	y	z						

MISCELLANEOUS EXERCISES.

Examples.	A
	$\sim$
	B
	$\sim$
	$x y z$
	1. 1 8 4
	2. 3 3 7
	3. 6 9 2
	4. 4 7 6
	5. 2 0 8
	6. 3 5 6
	7. 5 7 5
	8. 9 9 3
	9. 8 8 8
	10. 4 4 7
	11. 2 0 6
	12. 4 1 7
	13. 6 2 1
	14. 5 8 4
	15. 2 9 0
	16. 9 4 0
	17. 7 0 0
	18. 2 9 8
	19. 4 7 5
	20. 6 2 7
	21. 5 8 6
	22. 2 1 9
	23. 9 8 4
	24. 7 6 8
	25. 5 1 1
	$x y z$

523. What sum must I invest at 5 % that the interest may pay a salary of x thousand dollars per annum?

524. Change x pounds y shillings z pence sterling to United States currency, allowing $23\frac{1}{4}$ % in favor of England for exchange and premium on gold. (Ans. in mills with fraction.)

525. Find 20 % of 25 % of 120 % of B feet.

526. What is the difference between the simple and the compound interest of A dollars for 1 yr. 6 mo., at 7 %?

527. Find the length of a walk which extends diagonally across a square lot of land containing B acres? (Root to tenths.)

528. How many acres and rods in a circular park whose diameter is B rods? (Ratio 3.1416.)

529. At what rate %, simple interest, will any principal be doubled in $x + y$ years?

530. I sold two cows at B dollars each, on one I gained 25 %, on the other I lost $x + y$ %; find the gain or loss on the two. (Ans. exact.)

531. What sum must I deposit in a savings bank which pays a semi-annual dividend of x %, that it may amount to A dollars in 2 years?

532. What must I ask for syrup, which cost B cents per gallon, that I may discount 5 % for cash, and still make 20 %?

533. A rectangular field contains $x + y$ acres; its width equals $\frac{1}{4}$ of its length; find its dimensions in rods.

534. An ice-house contains B thousand cubic feet; if the height of the house is $\frac{1}{2}$ the width and $\frac{1}{4}$ the length, what are the several dimensions?

535. S. invests in a mortgage which pays $3\frac{1}{2}$ %, semi-annually, and T. in U. S. 6 %'s, at 114; when gold is at a premium of $x + y + z$ %, which is the better investment, and how much better?

536. What length of iron will be required to hoop a tub at top and bottom, allowing nothing for overlapping, the top diameter being 2 ft. x in., the bottom 2 ft. y in.?

537. I have a corner lot $x + y$ chains on one road, and B chains on the other; the road is 4 rods wide; how many acres and rods in the road against my lot.

538. How many rods and feet in a quadrangular lot, two of whose sides are parallel, A and B feet long respectively, and 90 feet apart?

DATA FOR NOTES.

EXERCISE 539 AT 6 %. | EXERCISE 540 AT 7 %.

1. Principal, \$4500. Date, March 4, 1866. Indorsements: Dec. 16, 1866, \$2000; Sept. 22, 1867, \$100; April 9, 1868, \$500. What was due June 20, 1869?
2. Principal, \$1500. Date, Sept. 10, 1867. Indorsements: April 14, 1868, \$100; Aug. 28, 1868, \$25; May 4, 1869, \$50. What was due Dec. 15, 1869?
3. Principal, \$2000. Date, Aug. 10, 1865. Indorsements: Dec. 10, 1865, \$25; May 20, 1866, \$100; Jan. 6, 1867, \$50. What was due Oct. 12, 1868?
4. Principal, \$1000. Date, May 4, 1865. Indorsements: Nov. 4, 1866, \$90; April 12, 1867, \$400; June 20, 1869, \$50. What was due Feb. 12, 1870?
5. Principal, \$970. Date, Oct. 9, 1866. Indorsements: July 9, 1867, \$43.65; Feb. 18, 1868, \$80; Nov. 12, 1868, \$100. What was due April 24, 1870?
6. Principal, \$500. Date, Feb. 15, 1867. Indorsements: May 30, 1868, \$75; March 12, 1869, \$160; Sept. 18, 1869, \$10. What was due June 15, 1870?
7. Principal, \$840. Date, July 12, 1868. Indorsements: Jan. 6, 1869, \$20; Dec. 28, 1869, \$200; Aug. 30, 1870, \$120. What was due Nov. 14, 1870?
8. Principal, \$5000. Date, June 24, 1865. Indorsements: Dec. 24, 1866, \$450; Aug. 6, 1867, \$150; March 10, 1869, \$1000. What was due Nov. 10, 1870?
9. Principal, \$1200. Date, Dec. 14, 1866. Indorsements: June 14, 1867, \$300; Sept. 2, 1868, \$40; Jan. 1, 1871, \$200. What was due July 1, 1871?
10. Principal, \$390. Date, Nov. 1, 1867. Indorsements: Sept. 20, 1868, \$95; Jan. 20, 1870, \$100; July 20, 1871, \$10. What was due Jan. 1, 1872?
11. Principal, \$800. Date, May 16, 1866. Indorsements: Feb. 28, 1867, \$200; Dec. 4, 1867, \$75; Aug. 10, 1868, \$50. What was due Jan. 1, 1869?
12. Principal, \$600. Date, Oct. 4, 1868. Indorsements: May 12, 1869, \$20; Nov. 14, 1869, \$75; July 30, 1870, \$200. What was due Jan. 1, 1871?

For the 1st answer in the Key the time is found by reckoning the entire calendar months and counting the remaining days.

For the 2d answer the time is found by subtracting dates, reckoning 30 days to the month.

EXERCISES CLASSIFIED AND ARRANGED.

The design of this work is to give independent practice to each member of a class, but it can be used with equal advantage as a text-book from which to assign regular lessons for study. To assign any one of the following lessons, the teacher should give the number of the lesson, and designate some particular example to be performed. If the 4th example were designated for the 9th lesson, the pupil should perform the 4th example in the 223d Exercise, the 4th in the 232d, etc. In the 2d, 3d, and 4th lessons, the examples are designated by letters.

By designating a different example each time a lesson is assigned, not only is the numerical work changed, but in some lessons the character of the examples is changed also.

The number of different times each lesson may be assigned and still have the numerical work of each example new, is indicated above the Exercises selected for each lesson.

LESSONS.

ADDITION.

(16 TIMES.)

1. Exercises 10, 11, 12, 15, 17, 18, 22, 23, 26, 146.

SUBTRACTION.

(A, B, C, etc., to Y.)

2. Exercises 38, 39, 40, 41, 42, 43, 44, 45, 46, 47.

MULTIPLICATION.

(A, B, C, etc., to Y.)

3. Exercises 71, 85, 87, 89, 90, 91, 92, 94, 95, 140.

DIVISION.

(A, B, C, etc., to Y.)

4. Exercises 109, 118, 126, 130, 132, 135, 136, 137, 139, 141.

REVIEW OF SIMPLE NUMBERS.

(25 TIMES.)

5. Exercises 145, 147, 150, 153, 155, 161, 164, 165, 166, 370.

UNITED STATES MONEY.

(25 TIMES.)

6. Exercises 156, 157, 158, 159, 160, 162, 163, 371, 390, 391.

PRIME FACTORS, DIVISORS, MULTIPLES, Etc.

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14. Exercises 315, 376, 382, 386, 416, 432, 458, 472, 489, 490.

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(25 TIMES.)

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(25 TIMES.)

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(25 TIMES.)

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35. Exercises 403, 410, 444, 449, 455, 467, 468, 474, 478, 540.

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36. Exercises 423, 448, 452, 465, 482, 485, 497, 526, 530, 532.

(25 TIMES.)

37. Exercises 386, 409, 425, 447, 451, 466, 495, 496, 498, 513.

(25 TIMES.)

38. Exercises 396, 420, 439, 457, 463, 500, 505, 508, 524, 535.

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39. Exercises 428, 453, 456, 477, 484, 487, 501, 506, 507, 512.

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40. Exercises 427, 429, 430, 503, 504, 518, 521, 527, 528, 537.

(25 TIMES.)

41. Exercises 515, 516, 517, 519, 520, 522, 533, 534, 536, 538.

SPECIAL REVIEW.

The following Exercises involve nearly all the principles usually found in Common School Arithmetics.

As no Exercise contains fewer than 12 examples, any example from 1 to 12 can be designated for the review. The answers to the 6th example in each Exercise can be found printed together on the last two pages of the Key. The answers to the other examples are given, but in their regular places.

No.	Exercises.	No.	Exercises.	No.	Exercises.	No.	Exercises.
1. . . .	17	26. . . .	242	51. . . .	459	76. . . .	410
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4. . . .	94	29. . . .	247	54. . . .	311	79. . . .	450
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25. . . .	241	50. . . .	297	75. . . .	408	100. . . .	538



1875



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